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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 406

INSCRIPTION OF LINEAR AND ANGULAR TOLERANCES

1st EDITION
December 1964

For each individual country the only valid standard is the national standard of that country.

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 406, *Inscription of Linear and Angular Tolerances*, was drawn up by Technical Committee ISO/TC 10, *Drawings (general principles)*, the Secretariat of which is held by the Association Suisse de Normalisation (SNV).

Work on this question by the Technical Committee began in 1951, taking into account the studies which had been made by the former International Federation of the National Standardizing Associations (ISA), and led, in 1961 to the adoption of a Draft ISO Recommendation.

In December 1961, this Draft ISO Recommendation (No. 493) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Australia	Hungary	Portugal
Austria	India	Republic of South Africa
Belgium	Ireland	Spain
Bulgaria	Israel	Sweden
Czechoslovakia	Italy	Switzerland
Denmark	Japan	Turkey
Finland	Netherlands	United Kingdom
France	New Zealand	U.A.R.
Germany	Norway	U.S.A.
Greece	Poland	U.S.S.R.
		Yugoslavia

Two Member Bodies opposed the approval of the Draft:

Canada
Romania

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in December 1964, to accept it as an ISO RECOMMENDATION.

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INSCRIPTION OF LINEAR AND ANGULAR TOLERANCES

INTRODUCTORY NOTE

For uniformity, all the linear dimensions given in this ISO Recommendation are in metric units. It should be understood that inch units could equally well have been used without prejudice to the principles established.

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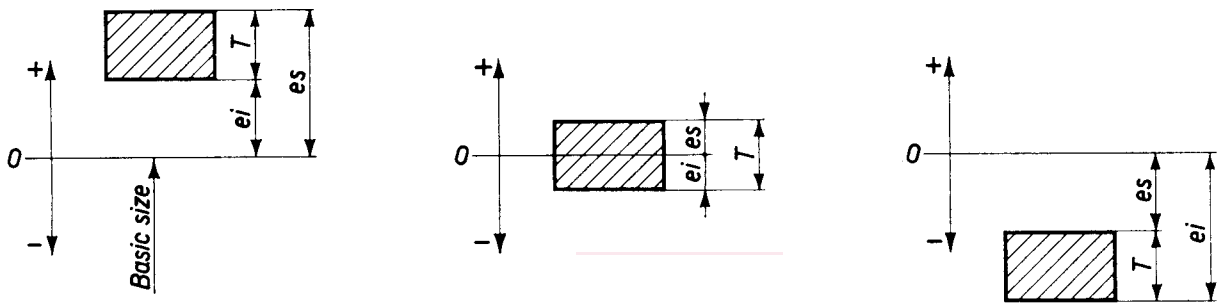
1. DEFINITIONS



T = *Specified tolerance*

O = *Zero line*

Straight line to which the deviations are referred. The zero line is the line when the deviation is nil, and represents the basic size.

es = *Upper deviation of a shaft*

Algebraical difference between the maximum limit of size and the corresponding basic size.

ei = *Lower deviation of a shaft*

Algebraical difference between the minimum limit of size and the corresponding basic size.

In the figures above, the deviations are given for a shaft. For a hole, ES is used for upper deviation and EI for lower deviation.

2. INSCRIPTION OF THE COMPONENTS OF A LINEAR DIMENSION

2.1 Tolerances shown by ISO symbols *

The components of the toleranced dimension are entered in the following order (Fig. 1):

(a) the basic size,
(b) the tolerance symbol,
(c) if it is necessary to express them, the values of the deviations, in parentheses (Fig. 2).

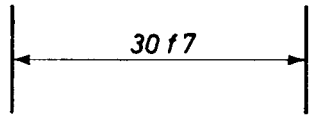


Fig. 1

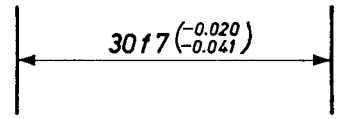


Fig. 2

2.2 Tolerances shown in figures

The components of the toleranced dimension are entered in the following order (Fig. 3):

(a) the basic size,
(b) the values of the deviations.

If one of the two deviations is nil, this should be expressed by the figure 0 (Fig. 4).

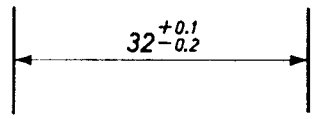


Fig. 3

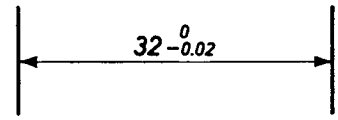


Fig. 4

2.3 Symmetrically disposed tolerance

If the tolerance is disposed symmetrically to the basic size, the value of the deviations should be written once only, preceded by the sign $\pm$ (Fig. 5).

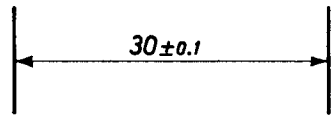


Fig. 5

* See ISO/R 286, *ISO System of limits and fits, Part I: General, tolerances and deviations.*

2.4 Limits of size

Limits of size may also be indicated according to Figure 6.

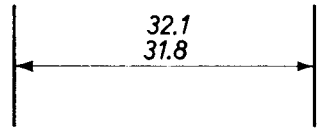


Fig. 6

2.5 Limits of size in one direction

If a dimension needs to be limited in one direction only, this should be indicated by adding «min.» or «max.» to the dimension (Fig. 7).

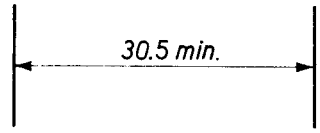


Fig. 7

3. ORDER OF INSCRIPTION OF THE DEVIATIONS

The upper deviation should be written in the upper position and the lower deviation in the lower position, whether for a shaft or for a hole (Fig. 8 to 10).

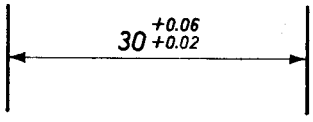


Fig. 8

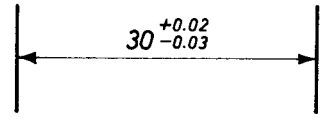


Fig. 9

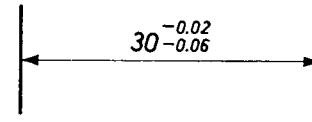


Fig. 10

4. UNITS

4.1 Units of the deviations

The deviations should be expressed in the same unit as the basic size. If a different unit is used, this should be written after the value of the deviation; if it is the same for all the tolerances on a drawing, a general note near the drawing title block should be used.

4.2 Number of decimals

Express both deviations to the same number of decimal places (Fig. 2), except in the case where one of the deviations is nil (Fig. 4).

5. TOLERANCES ON DRAWINGS OF ASSEMBLED PARTS

5.1 Tolerances shown by ISO symbols

The tolerance symbol for the hole is placed before that of the shaft (Fig. 11) or above it (Fig. 12), the symbols being preceded by the basic size written once only.

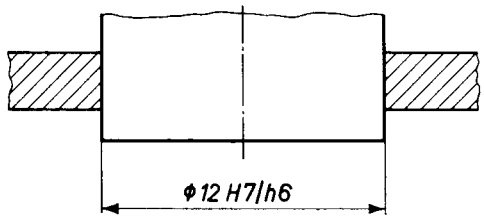


Fig. 11

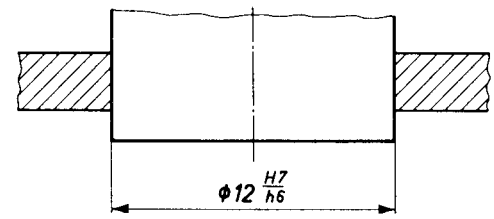


Fig. 12

If it is necessary to specify also the numerical values of the deviations, they should be written in parentheses as shown in Figure 13.

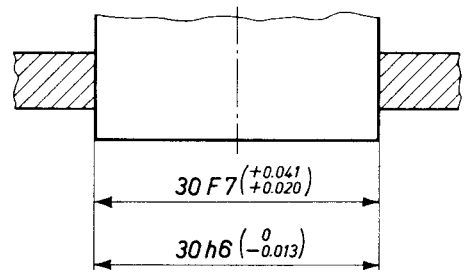


Fig. 13

(For the sake of simplicity, notwithstanding ISO Recommendation R 129, *Engineering drawing – Dimensioning*, clause 2.3.2, one may omit the lower dimension line, see Fig. 14 and Fig. 15).